CHEM 192 • Exam # 5 • Fall 2012 • 100 points Name: Key – v. 1

Multiple Choice (6 points each): Please write the letter of the best choice in the blank provided.

1. D A solution is prepared by dissolving 0.0584 mol of Na_2SO_4 in enough water to make 225 mL of solution. Calculate the solution molarity.

A) 0.0584 *M*
B) 1.87 *M*
C) 0.603 *M*
D) **0.260***M*
E) 0.484 *M*

2. E A 3.1-mol sample of $KClO_3$ was decomposed according to the equation below. How many moles of O_2 are formed assuming 100% yield?

$2KClO_3(s) \rightarrow 2KCl(s) + 3O_2(g)$

3.1 mol

A) 2.1 mol
B) 2.6 mol
C) 3.1 mol
D) 1.6 mol
E) 4.7 mol

$$3.1 \text{ mol } KClO_3 \left| \frac{3 \text{ mol } O_2}{2 \text{ mol } KClO_3} \right.$$

$$= 4.65 \text{ mol } O_2$$

3. B A solution is prepared by dissolving 20.0 g of potassium nitrate in 125.0 g of water. Calculate the mass percent of potassium nitrate in the solution.

A) 16.0 %
B) 13.8 %
C) 20.0 %
D) 86.2 %
E) 84.0 %

4. D When a solvent has dissolved all the solute it can at a particular temperature, it is said to be

A) diluted
B) unsaturated
C) supersaturated
D) saturated
E) none of these

5. B What is the concentration of bromide ions in a solution that is 0.40 *M* calcium bromide?

A) 0.40 *M*
B) 0.80 *M*
C) 0.20 *M*
D) 1.2 *M*
E) 0.60 *M*

$CaBr_2$

$\times 2$
$= 0.80\ M$

6. D Refer to the following equation below. How many molecules of water are produced if 9.12 mol of NO_2 is given off?

$4NH_3(g) + 7O_2(g) \rightarrow 4NO_2(g) + 6H_2O(g)$

A) 1.10×10^{25}
B) 5.49×10^{24}
C) 164.2
D) 8.24×10^{24}
E) none of these

$$\frac{9.12\ mol\ NO_2}{} \left| \frac{6\ mol\ H_2O}{4\ mol\ NO_2} \right| \frac{6.022 \times 10^{23}\ molec}{1\ mol\ H_2O}$$

7. A What volume of 2.00 *M* sulfuric acid is required to prepare 250. mL of 0.125 *M* H_2SO_4?

A) 15.6 mL
B) 64.0 mL
C) 0.0640 mL
D) 62.5 mL
E) 25.0 mL

$M_1V_1 = M_2V_2$

$(2.00M)(V_1) = (0.125)(250\ mL)$

$V_1 = 15.6\ mL$

8. (5) Spell Professor Bates's favorite word in chemistry: Stoichiometry

9. (12) What mass of solute is contained in 64.9 mL of a 0.750 M solution of iron(III) chloride?

$$\frac{64.9\ \text{mL}}{1000\ \text{mL}} \left| \frac{0.750\ \text{mol}}{1\ \text{mol}} \right| \frac{162.2\ \text{g}}{} = \boxed{7.90\ \text{g}\ FeCl_3}$$

$FeCl_3$

Fe: 55.85 g/mol

Cl: 3 x 35.45 g/mol

162.2 g/mol

10. (16 points) Complete the following table for the following reaction. Assume 100% yield. Be sure to indicate + / – in the "moles REACTING" line.

	$P_{4(s)}$ +	$6\ Cl_{2(g)}$ →	$4\ PCl_{3(g)}$
Moles at the START	7	24	0
Moles REACTING	– 4	– 24	+ 16
Moles at the END	3 mol	Ø mol	16 mol

11. (25) Consider the reaction of tungsten (VI) oxide with hydrogen gas below. If 738 g of WO_3 is allowed to react with 125 g of H_2 gas:

A) What is the limiting reagent? WO_3
B) What is the theoretical yield (in grams) of free tungsten metal? 585 g
C) What mass of excess reagent remains? 106 g H_2

$WO_{3(s)}$ + 3 $H_{2(g)}$ → $W_{(s)}$ + 3 $H_2O_{(l)}$
738 g 125 g

Molar masses (g/mol):

WO_3 = 231.84 H_2 = 2.016
W = 183.84 H_2O = 18.02

LR

$$738\text{ g } WO_3 \left| \frac{1\text{ mol}}{231.84\text{ g}} \right| \frac{1\text{ mol W}}{1\text{ mol } WO_3} \left| \frac{183.84\text{ g W}}{1\text{ mol W}} \right. = 585\text{ g}$$

TY = 585 g

$$125\text{ g } H_2 \left| \frac{1\text{ mol } H_2}{2.016\text{ g } H_2} \right| \frac{1\text{ mol W}}{3\text{ mol } H_2} \left| \frac{183.84\text{ g}}{1\text{ mol W}} \right. = 3800\text{ g}$$

$$738\text{ g } WO_3 \left| \frac{1\text{ mol } WO_3}{231.84\text{ g } WO_3} \right| \frac{3\text{ mol } H_2}{1\text{ mol } WO_3} \left| \frac{2.016\text{ g } H_2}{1\text{ mol } H_2} \right.$$

= 19.3 g reacts

125 g start
− 19.3 g reacts
105.7 g = 106 g H_2 remains